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**EDUCATION:**

**1977 Ph.D.** Environmental Sciences and Engineering, Stanford University, USA
**1973 M.S.** Civil Engineering, Stanford University
**1972 B.S.** Chemical Engineering, Carnegie-Mellon University

**PROFESSIONAL EXPERIENCE:**

**2010-2011:** Senior Geological Scientist, Lawrence Berkeley National Laboratory
**1980-2010:** Senior Research Scientist, U.S. Geological Survey, Water Resources Division
**1989-90:** Visiting Scientist, Australian Nuclear Science and Technology Organization
**1980:** Guest Investigator, Woods Hole Oceanographic Institution.
**1978-80** Postdoctoral Scientist, Swiss Federal Institute for Water Resources (EAWAG), Zurich, Switzerland

**RESEARCH EXPERIENCE**

James A. Davis has performed extensive experimental research on geochemical processes occurring at mineral surfaces and their effects on water and sediment phase compositions in aquifers. The research has examined geochemical processes at multiple scales, from molecular-scale spectroscopic studies to large field-scale investigations. Current research is focused on the use of electron microscopy, scanning probe microscopy, and x-ray absorption spectroscopy to characterize the surfaces of natural materials. Dr. Davis's research experience includes 1) field investigations of radionuclide and metal contaminant transport at various physical scales and in differing geochemical regimes, including studies of how the transport of uranium(VI), arsenic(V) and arsenic(III) are affected by adsorption, redox reactions, and competitive sorption processes, 2) reactive transport modeling under conditions that apply to various environmental settings, including transport coupled with surface complexation and redox reactions, and 3) laboratory studies of sorption and transport of inorganic ions and description of the results with geochemical models that include surface complexation. An approach to modeling the influence of variable chemistry on radionuclide and metal ion adsorption and transport has been demonstrated at two field sites at the km scale (Naturita, CO and Cape Cod, MA). Other research interests include carbonate chemistry, permeable reactive barriers for groundwater remediation, and the spatial variability of hydrologic and geochemical properties in aquifers.

**PROFESSIONAL SOCIETIES:**

American Chemical Society, American Geophysical Union, Geochemical Society

**HONORS:**

**2010-2011:** CSIRO Distinguished Visiting Scientist, Land and Water Division, Perth, Australia
**2001** Noted as author of one of the 10 most cited articles in journal history, *Environmental Science and Technology*.
**2000** Secretary of Interior's Distinguished Service Award, for outstanding scientific

contributions

**PROFESSIONAL ACTIVITIES**

Organizing Committee and Panel Chair, DOE Workshop on Basic Research Needs for the Geosciences, Nuclear Waste Disposal and Carbon Sequestration, 2006-2007.

Technical Direction Team, Sorption Project, Nuclear Energy Agency (OECD, Paris): A team of five selected international experts working to evaluate the potential use of thermodynamic sorption models in nuclear waste performance assessment modeling, 2000-2007.

Chairman, Working Group on Subsurface Reactive Transport Modeling, Interagency Steering Committee on Multimedia Environmental Models, 2003-2006.

Program Committee, Geotrap-V Workshop on the Transport of Radionuclides in Heterogeneous Geologic Media: Oskershamn, Sweden, May 2001.

Associate Editor, Water Resources Research: 1997-2001.

Executive Committee, Hydrology Section, American Geophysical Union: 1995 - 1997.

Nuclear Regulatory Commission Review Panel: Technical review of the Sorption for High-Level Waste Performance Assessment Research Program of the U. S. Nuclear Regulatory Commission, 1995.

Chairman, Geochemistry Division, American Chemical Society: 1992.

Program Chairman, Geochemistry Division, American Chemical Society: 1991.

**Symposium organization**:

1) Symposium Co-Chairman for “Metal and Metalloid Speciation and Adsorption”, National ACS meeting, Salt Lake City: March 2009

2) Symposium Co-Chairman for “Groundwater Remediation of Trace Metals, Radionuclides, and Nutrients with Permeable Reactive Barriers”, AGU National Meeting, San Francisco: Dec. 1999.

3) Symposium Chairman for "Surface Chemistry of Natural Materials", Goldschmidt Conference, Reston, VA, May 1992.

4) Symposium Chairman for "Aqueous Chemistry and Geochemical Cycles of Iron and Manganese", National ACS meeting, Miami, Sept. 1989.

5) Symposium Chairman for "Chemical Reactions at the Mineral/Water Interface", National ACS meeting, Chicago, Sept. 1985.

**Book Editing:**

1) Davis, J. A., and Hayes, K. F., (eds), 1986, *Geochemical Processes at Mineral Surfaces*, American Chemical Society Symposium Series, v. 323, 700 pages.
2) D. A. Naftz, S. J. Morrison, J. A. Davis, and C. C. Fuller (eds), 2002, *Groundwater Remediation of Trace Metals, Radionuclides, and Nutrients with Permeable Reactive Barriers*, Academic Press.

**Patents Held:**

Aquifer Remediation Barrier for Removal of Inorganic Contaminants, Patent no. 6,428,695 B1, Inventors: Dave Naftz and James Davis and Dave Naftz, August 2002.

Deep Aquifer Remediation System, Patent No.6,458,271 B1, Inventors: Dave Naftz and James Davis, October 2002.

**James A. Davis**
**Publications**


Davis, J.A. and Jacknow, J., 1975. Heavy metals in three urban areas. J. Water Poll. Control Fed., 7, p. 2292.

Davis, J.A. and Leckie, J.O., 1978. Proceedings, 3rd Int. Sym. Environ. Biogeochem., 3, p. 1009-1024.

Davis, J.A., James, R.O. and Leckie, J.O., 1978. Surface ionization and complexation at the oxide/water interface. I. Computation of electrical double layer properties in simple electrolytes. J. Colloid Inter. Sci., 63, 480-499.

James, R.O., Davis, J.A. and Leckie, J.O., 1978. Computer simulation of the conductometric and potentiometric titrations of the surface groups on ionizable latexes. J. Colloid Inter. Sci., 65, 331-343.

Davis, J.A. and Leckie, J.O., 1978. Surface ionization and complexation at the oxide/water interface. II. Surface properties of amorphous iron oxhydroxide and adsorption of metal ions. J. Colloid Interface Sci., 67, 90-107.

Davis, J.A. and Leckie, J.O., 1978. Effect of adsorbed complexing ligands on trace metal uptake by hydrous oxides. Environmental Science and Technology, 12, 1309-1315.

Davis, J.A. and Leckie, J.O., 1979. Speciation of adsorbed Ions at the oxide/water interface. In Chemical Modeling in Aqueous Systems, E. A. Jenne, Ed., ACS Symposium Series 93, Ch. 15, p. 299-317.

Leckie, J.O. and Davis, J.A., 1979. Aqueous environmental chemistry of copper. In Copper in the Environment, Part 1. J. O. Nriagu, Ed., J. Wiley and Sons, p. 90-121.

Zurcher, F., Thuer, M. and Davis, J.A., 1980. Importance of particulate matter on the load of hydrocarbons of motorway runoff and secondary effluents. In Hydrocarbons and Halogenated Hydrocarbons in the Aquatic Environment, B. K. Afghan and D. Mackay, eds., Plenum Pub. Corp. p. 373-395.

Davis, J.A. and Leckie, J.O., 1980. Surface ionization and complexation at the oxide/water interface. III. Adsorption of Anions. J. Colloid Interface Sci., 74, 32-43.

Davis, J.A. and Umana, A.F., 1980. Water supply, wastewater, and solid waste disposal in Costa Rica. Tech. Memo., Dept. of Civil Eng., Univ. of Costa Rica.

Davis, J.A., 1980. Adsorption of natural organic matter from freshwater environments by aluminum oxide. In Contaminants and Sediments, 2, R. A. Baker, Ed., Ann Arbor Science Pub. p. 279-304.

Davis, J.A. and Gloor, R., 1981. Adsorption of dissolved organics in lakewater by aluminum oxide: Effect of Molecular Weight. Environmental Science and Technology, 15, 1223-1229.

Davis, J.A., 1982. Adsorption of natural dissolved organic matter at the oxide/water interface. Geochimica et Cosmochimica Acta, 46, 2381-2393.

Luoma, S.N. and Davis, J.A., 1983. Requirements for modeling trace metal partitioning in oxidized estuarine sediments. Marine Chemistry, 12, 159-181.

Davis, J.A., 1984. Complexation of trace metals by adsorbed natural organic matter. Geochimica et Cosmochimica Acta, 48, 679-671.

Clapper, D.L., Davis, J.A., Lamothe, P.J., Patton, C. and Epel, D., 1984. Involvement of zinc in the regulation of pH , motility, and acrosome reactions in sea urchin sperm. J. Cell Biology, 100, 1817-1824.

Kuwabara, J.S., Davis, J.A., and Chang, C.C.Y., 1985. Culturing selenastrum carpricornutum in a synthetic algal nutrient media with defined particulates. Hydrobiologia, 124, 23-27.

Clapper, D.L., Lamothe, P.J., Davis, J.A. and Epel, D., 1985. Sperm mobility in the horseshoe crab. V. Zinc removal meditates chelator initiation of mobility. J. of Experimental Zoology, 236, 83-91.

Kuwabara, J.S., Davis, J.A., and Chang, C.C.Y., 1986. Algal growth response to particle-bound orthophosphate and zinc. Limnology and Oceanography, 31, 503-511.

Davis, J.A., and Hayes, K. F., 1986. Geochemical processes at mineral surfaces: An overview. In Davis, J. A., and Hayes, K. F., (eds) Geochemical Processes at Mineral Surfaces, American Chemical Society Symposium No. 323, p. 2-18.

Chang, C.C.Y., Davis, J.A., and Kuwabara, J.S., 1987. A study of metal ion adsorption at low suspended solid concentrations. Estuarine and Coastal Shelf Science, 24, 419-424.

Davis, J.A., Fuller, C.C., and Cook, A D., 1987. A model for trace metal sorption processes at the calcite surface: Adsorption of Cd and subsequent solid solution formation. Geochimica et Cosmochimica Acta, 51, 1477-1490.

Fuller, C.C., and Davis, J.A., 1987. Processes and kinetics of $Cd^{2+}$ sorption by a calcareous aquifer sand. Geochimica et Cosmochimica Acta, 51, 1491-1502.

Davis, J A., Fuller, C.C., 1987. The Roles of complexation and adsorption processes in toxic metal transport. In Program Overview and Selected Papers from the Toxic Waste Program Technical Meeting: Tucson, March 1984, US Geological Survey Open File Report 86-324, p. 107-116.

Gruebel, K.A., Davis, J.A., and Leckie, J.O., 1988. The Feasibility of using sequential extraction techniques for As and Se in soils and sediments. J. Soil Science Soc.Am. 52, 390-397.

Dempsey, B., Davis, J.A., and Singer, P., 1988. A Review of solid-solution interactions and implications for the control of trace inorganic materials in water treatment. J. Amer. Water Works Assoc. 80, 56-64.

Fuller, C.C., Davis, J.A., and Claypool-Frey, R.G., 1988. Desorption of arsenic from iron hydroxide precipitates in Whitewood Creek in US Geological Survey Applied Research Studies of the Cheyenne River System; K. E. Goddard, Ed., US Geological Survey Open-File Report 88-484, p. 118-147.

Davis, J.A. and Hem, J.D., 1989. The Surface chemistry of aluminum oxides and hydroxides. The Environmental Chemistry of Aluminum (G. Sposito, Ed.), CRC Press Inc, Ch. 7, p. 185-219.

Kuwabara, J.S., Chang, C.C.Y., Cloern, J.E., Fries, T.L., Davis, J.A. and Luoma, S.N., 1989. Trace metal associations in the water column of South San Francisco Bay, California. Estuarine, Coastal and Shelf Science, 28, 307-325.

Davis, J.A., Kent, D.B., and Rea, B.A., 1989. Field and laboratory studies of coupled flow and chemical reactions in the ground-water environment in Mallard, G. E., and Ragone, S. E. (eds). US Geological Survey Water-Resources Investigations report 88-4220, p. 189-198.

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Davis, J.A., Fuller, C.C. Rea, B.A., and Claypool-Frey, R.G., 1989, Sorption and coprecipitation of arsenate by ferrihydrite: Water-Rock Interaction (D. L. Miles, ed.) Balkema, Rotterdam, p. 187-189.

Kent, D.B., Davis, J.A., Maest, A.S., and Rea, B.A., 1989, Field and laboratory studies of transport of reactive solutes in groundwater: Water-Rock Interaction, (D. L. Miles, ed.) Balkema, Rotterdam, p. 381-383.

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Davis, J.A., and Kent, D.B., 1990. Surface complexation modeling in aqueous geochemistry, in Mineral-Water Interface Geochemistry (M. F. Hochella and A. F. White, eds)., Reviews in Mineralogy, v. 23, Mineralogical Society of America, p. 177-260.

Davis, J.A., Kent, D.B., Rea, B.A., Garabedian, S.P., and Anderson, L.C.D., 1991. Effect of the geochemical environment on heavy metal transport in groundwater, in U. S. Geological Survey Water Resources Investigations Report 91-4304, p. 53-62.

Rea, B.A., Kent, D.B., LeBlanc, D.R., and Davis, J.A., 1991, Mobility of Zn in a sewage-contaminated aquifer, Cape Cod, Massachusetts, in U. S. Geological Survey Water Resources Investigations Report 91-4304, p. 88-95.

Kent, D.B., Davis, J.A., Anderson, L D., and Rea, B.A., 1991. Transport of Zn in ground water in the presence of a strong complexing agent: Competing roles of sorption, complexation, and mineral dissolution, in U. S. Geological Survey Water Resources Investigations Report 91-4304, p. 78-83.

Davis, J. A., Waite, T. D., Kent, D.B., and Anderson, L.C.D., 1991. Reduction of Cr(VI) under mildly reducing conditions in a shallow, sand and gravel aquifer, in U. S. Geological Survey Water Resources Investigations Report 91-4304, p. 72-77.

Anderson, L.D., Kent, D.B., and Davis, J.A., 1991. Adsorption and reduction of Cr(VI) under oxic conditions: Studies of Cr(VI) reactions with sand from a shallow aquifer at Cape Cod, Massachusetts, in U. S. Geological Survey Water Resources Investigations Report 91-4304, p. 63-71.

Fuller, C.C., Coston, J.A., Hess, K.M., and Davis, J.A., 1991. Spatial heterogeneity of geochemical and hydrologic properties of subsurface materials in a sand and gravel aquifer, Cape Cod, Massachusetts, in U. S. Geological Survey Water Resources Investigations Report 91-4304, p. 84-87.

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Davis, J.A., Kent, D.B., Rea, B.A., Maest, A.S., and Garabedian, S.P., 1993. Influence of redox environment and aqueous speciation on metal transport in groundwater: Preliminary results of tracer injection studies, in Metals in Groundwater (H. E. Allen, E.M. Perdue, and D. S. Brown, Eds.), Lewis Publishers, p. 223-273.

Waychunas, G.A., Rea, B.A., Fuller, C.C., and Davis, J.A., 1993. Surface chemistry of ferrihydrite. I. EXAFS studies of the geometry of coprecipitated and adsorbed arsenate. Geochimica et Cosmochimica Acta, 57, 2251-2269.

Fuller, C.C., Davis, J.A., and Waychunas, G.A., 1993. Surface chemistry of ferrihydrite: 2. Kinetics of arsenate adsorption and coprecipitation. Geochimica et Cosmochimica Acta, 57, 2271-2282.

Davis, J.A., Fuller, C. C., Coston, J. A., Hess, K. M. and Dixon, E., 1993. Spatial heterogeneity of geochemical and hydrologic parameters affecting metal transport in groundwater. EPA/600/S-93/006. *Environmental Research Brief*, US EPA, Ada OK, 22 pages.

Davis, J.A., Kent, D.B., Coston, J.A., and Hess, K.A., 1994, Heavy-metal transport in a sand and gravel aquifer with variable chemical conditions, Cape Cod, Massachusetts, in U. S. Geological Survey Water Resources Investigations Report 94-4015, v. 1, p. 219-225.

Fuller, C.C., Coston, J.A., Davis, J.A., and Dixon, E., 1994, Evaluation of geochemical indicators of metal adsorption in a sand and gravel aquifer, Cape Cod, Massachusetts, in U. S. Geological Survey Water Resources Investigations Report 94-4015, v. 1, p.227-234.

Rea, B.A., Kent, D.B., Anderson, L.C.D., Davis, J.A., and LeBlanc, D. R., 1994, The transport of

inorganic contaminants from a sewage plume in the Cape Cod aquifer, Massachusetts, in U. S. Geological Survey Water Resources Investigations Report 94-4015, v. 1, p. 191-198.

Hess, K.M., Davis, J.A., Fuller, C.C., and Coston, J.A., 1994, Spatial variability of metal-ion adsorption and hydraulic conductivity in a sand and gravel aquifer, Cape Cod, Massachusetts, in U. S. Geological Survey Water Resources Investigations Report 94-4015, v. 1, p. 235-242.

Kent, D.B., Davis, J.A., Anderson, L.C.D., Rea, B.A., and Waite, T.D., 1994. Transport of chromium and selenium in the suboxic zone of a shallow aquifer: Influence of redox and adsorption reactions, Water Resources Research, 30, 1099-1114.

Anderson, L.D., Kent, D.B., and Davis, J.A., 1994. Batch experiments characterizing the reduction of Cr(VI) using suboxic material from a mildly reducing sand and gravel aquifer, Environmental Science and Technology, 28, 178-185.

Rea, B.A., Davis, J.A., and Waychunas, G.A., 1994. Studies of the reactivity of the ferrihydrite surface by iron isotopic exchange and Mossbauer spectroscopy, Clay and Clay Minerals, 42, 23-34.

Fuller, C.C., and Davis, J.A., 1994. Evaluation of the processes controlling dissolved arsenic in Whitewood Creek, South Dakota: In Origin, Transport, and Fate of Arsenic-Contaminated alluvial Sediments in the Cheyenne River System, South Dakota: U. S. Geological Survey Water-Supply Paper 2385, Chapter E, p. 55-75.

Waite, T.D., Davis, J.A., Payne, T.E., Waychunas, G.A., and Xu, N., 1994. Uranium(VI) adsorption to ferrihydrite: Application of a surface complexation model. Geochimica et Cosmochimica Acta, 58, 5465-5478.

Payne, T.E., Davis, J.A., and Waite, T.D., 1994. Uranium retention by weathered schists - The role of iron minerals. Radiochimica Acta, v. 66/67, 297-303.

Kent, D. B., Davis, J.A., Anderson, L.C.D., and Rea, B. A., 1995. Transport of chromium and selenium in a pristine sand and gravel aquifer: Role of adsorption processes, Water Resources Research, 31, 1041-1050.

Friedly, J.C., Davis, J.A., and Kent, D.B., 1995. Modeling hexavalent chromium reduction in field-scale transport and laboratory batch experiments. Water Resources Research, 31, 2783-2794.

Gruebel, K.A., Davis. J.A., and Leckie, J.O., 1995. The kinetics of oxidation of selenite (Se IV) to selenate (Se VI) in the presence of oxygen, titania and light. Environmental Science and Technology , 29, 586-594.

Coston, J.A., Fuller, C.C., and Davis, J.A., 1995. $Pb^{2+}$ and $Zn^{2+}$ adsorption by a natural Al- and Fe-bearing surface coating on an aquifer sand. Geochimica et Cosmochimica Acta, 59, 3535-3548.

Goldberg, S., Davis, J. A., and Hem, J.D., 1995. The surface chemistry of aluminum oxides and hydroxides. The Environmental Chemistry of Aluminum (G. Sposito, Ed.), 2nd Edition, CRC Press Inc, p. 271-331.

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Waychunas, G.A., Davis, J.A., and Fuller, C.C., 1995. Geometry of sorbed arsenate on ferrihydrite and crystalline FeOOH: Re-evaluation of EXAFS results and topological factors in predicting sorbate geometry, and evidence of monodentate complexes. Geochimica et Cosmochimica Acta, 59, 3655-3661.

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Kohler, M., Curtis, G.P., Kent, D.B. And Davis, J.A., 1996. Experimental investigation and modeling of uranium(VI) transport under variable chemical conditions. Water Resources Research, 32, 12, 3539-3551.

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